

PROTECTION OF HIGHWAY WATER SUPPLIES*

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THE SOURCES of water supply along our public highways have of late assumed a far greater importance in state public health programs than they ever did before the day of the automobile and the improved road.

THE GENERAL PROBLEM

State health departments have long recognized the necessity for the supervision of public water supplies and by continued effort have succeeded in securing adequate protection of the majority of these supplies. Work of this kind has been at times very difficult of accomplishment and there are still cities whose water supplies cannot be classed as safe, but in those states where an efficient sanitary engineering division is functioning as a part of the state health department the number of unsafe municipal water supplies is becoming less each year. The fact that the water in most of our cities is safe to drink gives the inhabitants of these cities a feeling of security and they do not realize that all of the waters which are found along the highways are not of the same satisfactory quality as that to which they have been accustomed in their own homes.

We must recognize the fact that in spite of our educational work the average citizen has but a very hazy idea of the sanitary requirements of a safe water supply. If the water is clear, cold, and pleasing to the taste the general public is satisfied that it is safe to drink, and

the average citizen will drink where water of this kind may be found. Let us admit frankly that our educational campaigns have not thus far produced results which make it advisable to let the average citizen judge for himself whether or not a safe drinking water may be obtained from a particular source. This is not a criticism of the methods of health education which have been used but rather a recognition of the fact that the work has not yet accomplished all that we hope it ultimately will do.

The steadily increasing mileage of improved roads which radiate from our cities makes it possible for the city motorist to go almost anywhere that his fancy dictates and he can travel as far into the country as time and speed limits will permit. There seems to be an inbred longing in most city dwellers to get out into the open country. The radius of an automobile owner's environment is many times greater than it was before he drove a car.

Touring by automobile is becoming more popular every year. The amount of tourist travel over our public highways has become so great that the business of supplying the needs of tourists along our main highways has become very important. Most cities and towns provide public camping grounds where the tourist may camp if he so desires. These municipalities feel that it is worth while to provide suitable accommodations in order that the tourist may carry away with him a favorable impression of the community. Tourist travel moves over considerable distances and differs in this respect from

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the city to country travel. Together they form a large percentage of the traffic on state highways.

These increased movements of population mean, from a public health standpoint, increased possibilities of infection. If the progress which has been made in the control of food and water supplies and the sanitation of the environment in our cities is to be maintained, the attention of public health officials must be given to the supervision and control of food supplies, water supplies and sanitation along the state highways. Work of this kind is statewide and should properly be handled by the state department of health. In some states investigation, control, and supervision of wayside refreshment stands, sanitation of tourist camps, and roadside sources of water supply have been inaugurated. Only one phase of the problem which the use of automobiles has brought will be discussed here—the control of highway water supplies.

Water is a necessity for the comfort and convenience of motorists and in most sections of the country may be found at intervals along the highways. The undeveloped sources are roadside springs, small streams and rivers. The developed sources may be divided into two general classes. The first class includes developments generally supplied under pressure. These supplies furnish considerable quantities of water through small distribution systems, either by gravity or mechanical pumping, and are found at hotels, inns, restaurants, consolidated schools, factories, country clubs, and small villages. In the second class the supplies are generally developed to furnish only a small quantity of water. This class of supplies includes the small wells in the school, tourist camp, summer resort, church, garage and gasoline filling station, and that by the roadside. All of these sources of water supply are found along our state highways and they are used by the average motorist without much discrimination.

The automobile has given considerable importance to these roadside supplies. Most of them were originally developed to serve only a few people and were essentially private supplies. Now their proximity to the highway and the consequent use of them by greater numbers of people make it advisable to classify them as semi-public water supplies. The diversity of sources and types of development, together with a lack of knowledge of the sanitary requirements of a safe water supply on the part of the average motorist, makes it almost impossible for him to discriminate between water supplies that are reasonably safe and those that are of questionable quality. As a result of observations made during the investigation of roadside water supplies on 2,000 miles of state highways the writer came to the conclusion that the average motorist pays very little attention to the sanitary surroundings or the type of construction of a roadside water supply. Investigation and control of roadside water supplies by state departments of health seem to be necessary if the dangers involved in the indiscriminate use of such water supplies are to be controlled.

Briefly stated, a workable program for the control of roadside or semi-public water supplies must take into consideration the following factors:

1. The greatly increased use of such supplies which results from the increased movements of population made possible by the automobile and improved roads
2. The variety of sources of water supply and types of development of these sources which are to be found along the highways
3. The fact that the city resident has come to accept a safe water in his home as a matter of course
4. The inability of the average citizen to judge by inspection whether or not a roadside water supply is safe.

PRESENT STATUS OF THE WORK

During the past summer the writer has attempted by correspondence to obtain information in regard to the present status of roadside water supply work in

this country. Replies have been received from the state health departments of 40 states. Definite programs for marking safe sources of water supply along the principal highways are being carried out in 10 states.* Sanitary surveys and bacteriological examinations of roadside water supplies are being made in 5 states,† but no signs have been erected. The water supplies at tourist camps are supervised by the state health departments in 3 states.‡ Preliminary investigation of the problem has been started in 2 states.§ No information was received from 8 states.|| There were 20 states reporting that no work of this kind had been done.

Although no "safe" signs have been erected it has been the practice of the Rhode Island State Department of Health for some years to examine all public wells, springs, including roadside supplies, at least once each year. In case wells or springs are found to be unsafe the local health officer or town having jurisdiction is directed to close them to public use. Work of this kind indirectly accomplishes the same result as the posting of safe supplies. On the basis of available data Rhode Island was the first state to attempt definite control of all the roadside water supplies within its boundaries.

THE WORK IN OHIO

The idea of placing some form of sign to inform the public where safe drinking water might be obtained along the highways seems to have originated in the Ohio Department of Health. Ohio was the first state to undertake this work and the programs in other states have been quite generally based on the methods and

experience obtained in Ohio. It is for this reason that the plan followed in Ohio will be described in some detail.

The work is being carried on by one sanitary engineer and one medical man assigned to it from another division of the department. Considerable work is being done by district health commissioners who are competent to perform the necessary work. In such instances, however, the results are finally checked by the state department of health. The field work consists of sanitary surveys of the sources of water supply which are available to the public along the highways. The data obtained by the surveyor is entered upon a special blank entitled "Report on Semi-Public Water Supply." This report covers the location of the supply, type of supply, structural conditions and the location of possible sources of contamination.

As a rule duplicate 4 ounce samples of water are taken from each source which is examined. There are exceptions when the source is obviously unsuitable. These samples are sent to the central laboratory at Columbus or to the laboratories of local health departments for examination. The time of transportation from field to laboratory never exceeds 24 hours. All samples must show absence of *B. Coli* in 1 and 10 c.c. portions in order to be declared satisfactory. If the first samples give unsatisfactory results a second set of samples may be taken if in the judgment of the investigator the water supply development is of such character that it should produce a safe water supply, or if after the first sampling improvements to the development are made which would warrant resampling. The results of the laboratory examination are entered in a space provided on the report form used for the sanitary survey. The completed report thus has complete field and laboratory data on the source of supply and enables the State Department of Health to determine whether or not the supply shall be approved.

* Connecticut, Delaware, Illinois, Kentucky, Michigan, Minnesota, Missouri, Ohio, Pennsylvania, and Washington.

† Arizona, Maine, New Mexico, Rhode Island, and Virginia.

‡ Maryland, Texas, and Utah.

§ Florida and West Virginia.

|| Arkansas, Idaho, Indiana, Nebraska, Nevada, North Dakota, Oregon, or Wyoming.

A water supply development when found satisfactory from the above viewpoints is advertised as such by a seal or certificate of safety. The seal of safety, a small yellow enameled metal disc, is used on the hand pumped well and is so placed on the pump barrel as to be easily visible to any user of the supply. These seals are serially numbered and dated. The supply developed under pressure such as is found at the modern centralized school, country club, etc., is indicated as safe by a certificate of safety. This certificate, which is also numbered and dated, is framed and placed in the building in some conspicuous place.

Additional and more conspicuous markings are furnished in many cases. Certain automobile clubs throughout the state furnish and erect adjacent to safe supplies, standard metal club markers approximately 20" x 27" in size. The division of highways also supplies standard road signs marked "Safe Drinking Water 500 Feet Ahead." The latter signs are utilized only at supplies located along state maintained roads, while the former are used at any desirable location.*

Before the seal or certificate of safety is placed on an approved source of supply a formal agreement between the owner, lessee, or tenant of the property upon which the supply is located and the Ohio Department of Health is signed in duplicate.

The department agrees to place at said water supply a seal or certificate to indicate its safety and to arrange for the erection of a sign on said property to show the presence of a safe water supply. The owner, lessee, or tenant agrees to permit the placing of these signs and further agrees to permit the removal of the signs when such removal is deemed advisable by the department of health. A definite agreement of this kind prevents misunderstandings on the part of the person controlling the supply. It gives him an opportunity to state definitely whether or not he wishes to have the supply marked and also makes it clear that the continued approval of the source of supply is a matter to be determined by the department of health. In Ohio periodic reexaminations of these approved supplies are made by the county health departments.

WORK IN OTHER STATES

Arizona—Wells and springs are not found along the roadside. The water supplies at established camps and resorts are inspected. Samples of 100 c.c. are taken from these sources and the safety is judged by the U. S. Treasury Standard, the opinion being based on a series of samples as the department feels that the results obtained on a single sample are only an indication of the probable quality of the water.

Connecticut—In this thickly populated state, with public water supplies at near intervals roadside water supplies are not a serious problem. Occasional inspections and sampling of roadside waters are done by two men who are engaged in the inspection of summer camps. No second sample is taken unless the results are doubtful. Distances are short so that samples are taken to the laboratory each day. Results are judged by the U. S. Treasury Standard. Unsatisfactory sources of supply are posted as unsafe.

Delaware—The department of health does not make a systematic survey of all the semi-public roadside water supplies. Instead, they select service stations at intervals along the highway and expect the public to obtain drinking water at these approved places. The signs are paid for by the owners of the service stations but are erected and maintained by the state highway department. The signs advertise "Safe Water and Sanitary Toilets."

Illinois—The work on roadside water supplies in Illinois was started in 1924. During that year about 200 samples were taken and 10 per cent were found satisfactory. The work this year is being done by one man with a car who makes the inspections, collects the samples, and later posts the sign on the approved supplies. No samples are taken from those sources which the sanitary survey shows to be unsatisfactory, but the owner is advised to make the necessary improvements. When the results of the laboratory examination are not up to the U. S.

* Semi-Public Water Supplies. *Administration Bull.* No. 137, Ohio Department of Health.

Treasury Standard, the supply is re-sampled. If several analyses are unsatisfactory the supply is condemned. Records of the work are filed in the office by route number and direction.

Kentucky—A small amount of work on roadside waters has been done during this year. Samples are taken in 125 c.c. quantity and sent to the central laboratory by mail. The U. S. Treasury Standard of purity is used to judge the results of laboratory examinations. Signs are posted by the county health officers.

Maryland—No approval signs are used. The water supplies at tourists' camps, which are leased from the state roads commission, are supervised by the state department of health. Sanitary surveys of these sources of drinking water are made and samples for both bacteriological and chemical analysis are taken. Additional samples for bacteriological examination are taken only in those instances where the sanitary survey and the chemical analysis are satisfactory. Maryland and Rhode Island are the only states reporting the use of a chemical examination as a part of the laboratory work.

Massachusetts—No work of this kind has been done for the reason that under existing laws in this state the state department of health has no right to mark a water supply on private land as to whether it is good or bad. The supervision of roadside water supplies comes within the duties of the local board of health. Massachusetts is another thickly populated state where public water supplies are not far apart.

Michigan—The following description of the work in this state was received from the director of the bureau of sanitary engineering.

A touring car with sample bottles and packing materials goes over the main trunk line highways and inspects water supplies where automobile travelers would be tempted to drink. If the surroundings of the drinking place seem favorable and if more than just a few persons drink at a given point each day, a sample is taken. Samples are stored in the car in a homemade box insulated against heat

by making its walls of double boards with corrugated paper between them. Ice can be kept in this box during hot days. The collecting of samples is stopped toward the end of the afternoon and the samples are wrapped with corrugated paper and packed in cartons with cotton to prevent breakage. The package is mailed as close as possible to the departure time of mails so as to travel at night. Ordinarily the package reaches the laboratory in the first mail next morning and always before noon. The analysis is started within a very short time after the samples arrive.

About 2 weeks behind the first car is another carrying the man who puts up the signs as near the well as possible. This man should visit all places where samples have been taken and give instructions, particularly to those whose wells have been found unsafe. An experienced man should be used on the work of posting. The collector can be taught how to do his work in a few days. A full description of each source is necessary and hard to get from an inexperienced collector. There is always a tendency to hurry too much.

Sample points are spotted and numbered on county maps (scale about 1 mile per inch) and a brief description is given. This enables the poster to find the place. When he arrives he asks for the letter from the office as a verification of the identification of the source and as a check on his record. From July 17 to September 11 four trunk lines were covered and 417 regular samples taken.

Blanks describing the source and surroundings are made out when the sample is taken. One copy goes to the laboratory and one to the engineering bureau and these are mailed at the same time as the samples. The results of the analysis are put on the laboratory copy of this blank and sent with copies to the engineering bureau. The director of the bureau makes the decision on the basis of the analysis and the description of the source and writes a letter to the owner of the well giving the decision as safe or unsafe for drinking. The copy of the original blank sent to the engineering bureau is to guard against losses of these data in the mails.

Minnesota—The division of Sanitation of the state board of health coöperates with the state highway department in the control of those roadside water supplies which are within the highway right-of-way. The highway department has submitted a list of all the roadside water supplies developed by them on trunk highways. Nearly all of these supplies have been investigated and have either been improved so as to make them satisfactory or the signs removed. The division of sanitation has prepared plans and specifications which are followed by the

highway department in developing new sources of supply. Most of these supplies are from springs. The signs placed on approved sources of water supply by the highway department advertise "Drinking Water—This supply developed by the Minnesota Highway Department. Approved by the Minnesota State Board of Health." This is an interesting example of the possibilities of coöperation between the state board of health and the state highway department in procuring satisfactory roadside water supplies.

Missouri—An interesting feature of the Missouri "Seal of Safety" campaign for the improvement of water supplies at summer resorts and along the state highways is the inclusion of other sanitary conditions about the premises in the requirements for a Seal of Safety certificate. After a sanitary survey has been made, a report with recommendations for improving sanitary defects is given to the owner of the premises. The Seal of Safety certificate indicates that both the premises and the water supply meet the sanitary requirements of the state board of health. Water samples are collected when the sanitary survey is made and sent by mail or express to the central laboratory. The time of transit averages 24 hours. Resamples are taken after the recommended improvements have been made.

New Mexico—Work is being done in 10 counties through full-time county health units. Sanitary surveys and laboratory examinations are made. In those instances where the source of supply is satisfactory from an environmental and structural standpoint but unsatisfactory from a bacteriological point of view, the source is given a heavy dose of hypochlorite of lime. Another sample is collected at a later date. No signs are erected.

Pennsylvania—Work on roadside water supplies has been carried on during the last 2 years. The outstanding feature is the use of field water laboratories. Dur-

ing the summer of 1924 the field work was done by a party consisting of a sanitary engineer, who made the sanitary surveys, a bacteriologist and a representative from the restaurant hygiene division. The field equipment consisted of a Ford roadster and a fully equipped field water laboratory. Samples of water were stored in a large vacuum jar during the day and the bacteriological analyses were always started within 6 hours after the sample was taken. This arrangement was very satisfactory as the uncertainty of the condition of the sample during shipment to a central laboratory was eliminated. Samples were also collected from all of the public water supplies along the routes covered by the field party. The reports of the sanitary survey together with the results of the laboratory examination of a sample from the source were sent to the central office for action. The safe drinking water signs were put up on approved sources by the local health officers.

The organization of the work in Pennsylvania has been changed somewhat this year. The inspection work is now handled by the district engineers and an additional field laboratory has been in service. As the district engineers reside in their respective districts, this makes it possible to give more attention to the follow-up work incident to the surveys. The method of marking the approved sources of water supply and the form of agreement with the owners is practically the same as those used in Ohio.

Texas—Only the roadside water supplies which are found at tourist camps have been investigated. The engineering division of the state board of health has formulated a very excellent plan for the sanitary control of these camps. Attractive signs are put up to indicate that the camp has been approved. The usual procedure is followed in the investigation and control of the camp water supplies.

Utah.—Work similar to that in Texas is being done in Utah, but no signs are used.

Virginia—Some preliminary work has been on parts of two of the main highways. This work was undertaken primarily with the object of finding out exactly what kind of a problem is involved in trying to cover all the main highways of the state. One of the interesting results of this work is the discovery that only a small percentage of semi-public supplies outside of cities is such as can be certified as being safe. The policy followed thus far has been to make the sanitary surveys on a certain highway and after these are completed to collect as many samples as possible during a day and take them into the laboratory that same day. No signs have been erected.

Washington—Work on the investigation and control of roadside water supplies was begun this year. The State Sanitary Engineer makes the sanitary surveys and collects the samples. After receiving the laboratory report he sends a list of the sources of water supply which are to be posted to the Automobile Club and to the state highway department. The Automobile Club ships the signs to the division engineer of highways who directs the maintenance department to erect them in the locations ordered by the health department. Each sign is numbered and a record is kept by each of the three agencies concerned.

West Virginia—This state is making a preliminary survey of the problem in connection with tourist camp work. A coöperative program between the state road commission and the health department will be followed out.

CONCLUSIONS

While the control of roadside water supplies is a comparatively new phase of sanitary engineering work the problem has been attacked by state depart-

ments of health in nearly every section of the country. Variations in climatic conditions, the progress of the improved road programs, and the density of population in the different states all affect the seriousness of the problem.

The plan of definitely marking satisfactory sources of water supply along the highway as "Safe" or "Approved" has not been so generally adopted in the different states as has the general plan of supervising these supplies. There is evidently a feeling in some departments that the matter of signs should be attacked from the negative rather than from the positive side, that is, that the posting should be done only at unsafe sources of supply.

Another interesting development of the work in some states has been the coöperation between the state health and highway departments in developing and maintaining sources of water supply within the highway right of way. It is the opinion of the writer that in many instances the installation of sanitary toilets in the vicinity of such sources of supply would add to the comfort and convenience of the motorists and at the same time decrease the possibilities of contamination of the water supply.

The control of highway water supplies is too new to evaluate it from a public health standpoint. It is hoped that data will gradually be collected which will show its effect on the prevalence of vacation typhoid fever. This is a type of work which the public understands and which has received very general approval. The favorable sentiment which the control of roadside water supplies has created, in the states where this work is being done, should help in obtaining more adequate support of the entire public health program.

DISCUSSION BY W. H. DITTOE, FELLOW A.P.H.A.

The Ohio Department of Health undertook a systematic examination of semi-public water supplies in February, 1924. Prior to this time

state supervision of public water supplies in Ohio had been established, but examination and supervision of semi-public water supplies had